[1.2 Who May be Affected]

EPA is concerned that individuals currently living in dwellings built over formerly **mined phosphate land**, or individuals that may in the future live dwellings built over formerly mined phosphate lands could be exposed to elevated levels of **radiation** [insert link]. Exposures to radiation could be in the form of direct exposure of gamma radiation to the body, the **ingestion** of radium contaminated soil or groundwater, or the inhalation of **radon gas**.

High doses of radiation can be harmful or even fatal. The potential for harmful effects is based on the type of radiation, the duration of exposure, and the part of the body that is exposed. The levels of radiation that EPA has observed thus far, and anticipates to see in the future, are comparatively low and would not be expected to pose any immediate threats. However, long-term exposures to low levels of radiation could result in delayed health effects such as cancer or other diseases or harmful effects on unborn children.

It is important to note that an average of one in four people develops some form of cancer during their lifetime. Excess lifetime cancer risks resulting from exposure to radiation would be in addition to this average. Because risk estimates assume that even small amounts of radiation pose some risks, EPA is concerned that increases in radiation in formerly mined phosphate lands could pose an incremental risks in cancer or other harmful effects to individuals living over these areas. Since an important factor in determining the potential for risk is the duration of exposure, EPA is currently focusing its assessment in areas where individuals on average spend the greatest amounts of time.

[1.2.1 Potentially Affected Parties]

EPA is most concerned with the potential for long-term exposure to individuals living in dwellings overlying formerly mined phosphate land since peoples homes are where they spend the greatest amount of time. As discussed under the introduction for this section, one of several key factors that effect the amount of harm that could be caused by long-term exposures to radiation is the duration of exposure. Because individuals by far would spend the greatest amount of time in their homes, this is where EPA is focusing its initial assessment efforts.

Other locations where people spend the balance of their time for activities such as work, school, church, or recreation may also be located over formerly mined phosphate land. However, because the length of time spent at these locations is much shorter than the time spent at an individual's home, the dose of radiation received at these locations would be expected to be much less.

[1.2.2 Potentially Affected Areas]

As discussed in the introduction to this section, EPA is most concerned with the potential for long-term exposure to individuals living in dwellings overlying formerly mined phosphate land since peoples homes are where they spend the greatest amount of time. A comparison of the location of the formerly mined land to residential tax records for Polk and Hillsborough County, Florida indicate that there is about 7000 acres of land currently used for residential purposes. Depending on the density of the residential development, its estimate that 30,000 to 40,000 individuals to live within this 7000 acre area. These estimates were based on the U.S. Bureau of Census 2000 estimate and do not reflect anticipated increase in developments and population growth.

The [maps and photos] page shows the locations of former and current phosphate mines, residential areas built over former phosphate mined lands, and areas that EPA plans to conduct it surveys.

[1.2.3 Length and Level of Exposure]

Given the comparatively lower levels of radiation that have been observed, no short-term or immediate health impacts are expected. EPA is conducting this work to investigate the possibility of increased risks for adverse health effects due to long-term exposures to comparatively lower levels of radiation. The potential for this to occur is believe to only be possible in cases where individual are living over formerly mined areas.

The length of exposure to radiation and the level of radiation that a person is exposed to greatly affects the potential health impacts. A person exposed to comparatively high levels of radiation over a short periods could be adversely impacted quickly. However, in the case of lower levels of radiation as anticipated to be found in the former phosphate mining areas, individuals would need to be exposed to these levels over many years for increases in adverse health effects.

[insert EPA link for additional bkg info.
http://www.epa.gov/radiation/understand/pathways.htm]

[1.3 Potential Impacts]

A primary goal for EPA's development of this web site is to aid the public in understanding the potential for health and environmental impacts that could result from radiation associated with formerly mined phosphate lands. Another goal is to put into perspective these **risks** with other risks that people encounter on a regular basis. A detailed discussion of the factors used in the evaluation of potential adverse health effects can be found at EPA's radiation web site. The following includes a brief discussion of the potential for human health, environmental, and socioeconomic impacts. [http://www.epa.gov/radiation/understand/health_effects.htm]

[1.3.1 Potential Health Impacts]

Often the radiation and the potential for increased risks for adverse health effects is greatly misunderstood. When the subject of radiation is raised, individuals frequently associate it with historical events with large scale release of radiation such as Three-Mile Island Nuclear Plant or the atomic bombs exploded over Japan during World War II. However, there are many other sources of radiation that individuals are exposed to in their daily lives.

Other sources include exposures to natural radioactive substances in the earth (e.g., uranium); human produced radioactive substances associate with the nuclear weapons industry (e.g., plutonium); cosmic radiation from outside the earth's atmosphere that generally increases with altitude; natural radiation in building materials (e.g., granite, drywall, cement); radioactive substances that occur in the human body naturally, and radiation from medical procedures (e.g., x-rays). The total annual dose that an individual is expected to receive is estimated a 300 **millirems per year (mRem/yr)**.

Radiation health experts currently estimate that overall, if each person in a group of 10,000 people exposed to 300 mRem of ionizing radiation, in small doses over a life time, 1 or 2 more people would be expected to die of cancer than would otherwise. This would be considered the **background** risks that an individual would be naturally encounter.

In the case of individuals residing over formerly mined phosphate lands, EPA is concerned that these residents could possibly double their level of radiation exposure.

[1.3.2 Potential Environmental Impacts]

Radium along with other related radioactive substances are naturally occurring in the environment and can be found in various plant and animal tissues. However, they are found naturally at levels that are low levels that would not be harmful to the plant or animal. The levels observed thus far associated with the phosphate mining activities are not believed to be at a level that would pose any increased environmental risks.

Plants and animals with increased radium levels could be consumed by humans, but the radium levels are still believe d to be too low to pose any increas

ed risk to humans. As discussed in the Potential Impacts Section, the primary risks to humans is from the long-term exposure to radiation from living over formerly mined phosphate lands.

[1.3.3 Other Potential Impacts]

EPA is aware that they maybe other potential social and economic impacts as a result of living or owning a home over formerly mined phosphate lands. However, the identification and evaluation of these potential impacts is beyond the scope of this project.

[1.4 Assessing the Problem]

An effort is underway by EPA, in cooperation with the Florida Department of Environmental

Protection and Department of Health to identify the area mostly likely affected with elevated levels of radiation. This effort includes both the collection of historical records and the collection of new data.

[1.4.1 Information Gathering]

Several key portions of information have been collected from the State, the County, and public census data bases to identify the areas of interest. Data regarding former mine locations and current residential parcels have been combined to form a "Location Map" that shows the area of interest. EPA limited its collection of information on mines to older mines that were operate prior to 1975. These older mines used less efficient mining techniques that could have resulted in higher levels of radiation. Also, these older mines were not required to undergo any formal closure.

[1.4.2 Pilot Radiation Assessment]

Another key portion of evaluating the potential risks to humans living over formerly mined phosphate land is the level of radiation that may be present. Several studies have been conducted by Federal and State agencies [ref. documents in this web site and ref. FIPR web] that provide information background and elevated levels of radiation.

- 1979 EPA Study
- 1978 State Study
- 1970's through 1990's State Studies

These studies show that the levels of radiation at most former mining areas are safe for long-term use. However, the studies also show that portions of some developed areas have elevated levels of radiation that could posed a long-term increase in health risks. This is most evident in the data collected by the Polk County Health Department from the mid-1970's through the mid-1990's. This data was collected as part of a county program that required the measurement of radiation levels prior to the development of the property. Some of the data indicate the presence of radiation levels above criteria considered safe for long-term exposure by EPA and the State of Florida.

EPA has decided that in order to fully assess the levels of radiation and potential impacts, it will be necessary to collect radiation data over all of the developed areas in Polk County that overly formerly mined phosphate lands. Although a significant amount of phosphate mining has been conducted in neighboring Hillsborough County, there has been much less development of the older mines into residential areas.

[1.4.2.1 Survey Purpose]

EPA has identified a total area of approximately 7000 acres of formerly mined land that

has been developed for residential purposes. The location of the these areas are shown on the location map. As shown on the location map, this 7000 acres of residential development are discontinuous and spread out over a much larger area. Conventional ground-base survey methods over such a large area would be cost-prohibitive.

In order to cost-effectively conduct this survey, EPA has designed a progressive approach that combines a variety of data collection methods. EPA's first data collection efforts will involve the measurement of radiation levels using a helicopter. This approach will enable EPA to measure levels rapidly over a large area. This data will direct EPA to areas on the ground that appear to have elevated levels of radiation that may warrant further investigation.

EPA will use a threshold value of **20 microroentgens/hour** (μR/hr) (above background) as an indicator of areas that may warrant further investigation. The 20 μR/hr (above background) is a federal regulatory limit established by EPA under the Uranium Mill Tailings Radiation Control Act of 1978 (40 CFR 192) designed to protect individuals from excess risks from indoor exposures to radon gas. Similarly, the State of Florida's Administrative Code (FAC 64E-5.1001) provides a that indoor gamma rates shall not exceed 20 μR/hr (including background) as a measure to protect individuals from increased risks from radon gas. Although this threshold will be applied to outdoor measurements, EPA believes that its appropriate in this case to use a conservative value as a screening tool. The commonly accepted background level resulting from naturally occurring gamma radiation in the study area is 6 μR/hr.

If after the collection and evaluation of the ground-based EPA determines that data additional study is needed, EPA will update this section of the web site with the additional study methods.

[1.4.2.2 Survey Description]

Radiation levels at the ground will be measured using a series of **sodium iodide detectors** mounted on a twin-engine helicopter. (Insert picture (Fig 6) of ANL work plan) The helicopter will fly a pre-determined path and will record radiation measurements every second. The helicopter will fly at a height of about 150-feet above the ground along parallel paths about 250-feet apart. The radiation level and the coordinates of the measurement will be automatically recorded by an onboard computer. The radiation levels and the location of the measurements will be used to develop **contour maps** that show gradual changes in radiation levels. These contour maps can then be used to determine if additional areas of study are warranted.

The flights will be conducted in the morning and afternoon during week days. Flights will not normally be conducted on the weekend, but may be conducted on Saturday's to make up time lost to weather or other delays. The survey is expected to take 14 days to complete. The helicopter and survey equipment is owned by and will be operated by personnel employed by the U.S. Department of Energy, National Nuclear Security

Administration.

[1.4.2.3 Survey Area (Map)]

Below are a series of maps that show important information on the extent of survey area, phosphate mining activities in the central Florida area, results from historical radiation monitoring.

- Survey Map (insert Brian's new base map that only shows the survey boundary) This map shows the general boundary of the area to be surveyed.

- Phosphate Mine Location Map (insert Brian's new base map with the location of the mandatory and non-mandatory mine locations denoted.

- Polk County Historical Data Survey Map: (insert the map from the June 2004 report)

[1.4.2.4 Who's Involved]

This project is being led by the US Environmental Protection Agency, Southeast Regional Office, in Atlanta, Georgia. It is being conducted in cooperation with the Florida Department of Environmental Protection, the Florida Department of Health, and the Polk County Health Department. EPA has contracted with the US Department of Energy, Remote Sensing Laboratory and the Argonne National Laboratory to provide logistical and technical support to EPA for the radiation monitoring. EPA has contracted with Black & Veatch to provide assistance with community

outreach.

Technical and media inquires regarding this project should be directed to the following EPA contacts. Forward any questions or comments you may have to EPA (insert link/button to contact EPA [(e:mail is actually routed to Bob and then forwarded to Brad for proper routing/response at EPA)]

Carol Monell, Chief
Superfund Remedial and Technical Services Branch

Carl Terry, Director
Office of External Affairs

[1.4.2.5 Survey Schedule]

Mobilization of equipment and personnel will begin the week of _____, 2005.. Helicopter flights are scheduled to begin the morning of _____ and continue through _____. Flights are scheduled to be conducted during the morning and afternoon hours on weekdays. On occasion, flights may be conducted on Saturday to make-up for lost time during the week as a result of weather or technical delays.

EPA anticipates that after the completion of the aerial survey, the results will be available for review on this web site in late-2005.

[1.4.2.6 Survey Results]

As discussed earlier, EPA anticipates that these results will provide an initial indication of possible residential areas with elevated radiation levels as a result of former phosphate mining activities. If further studies are warranted, these results will serve as a guide in conducting additional assessments.

[1.5 What Can You Do]

The most important thing you can do at this time is to become a well informed citizen. EPA has developed this web site, in part, to help educate the community about the nature and extent of the potential hazards and the potential risks. The following discussed ways individuals may obtain additional information.

[1.5.1 Learn More]

More detailed information regarding radiation, exposures, and risks can be found at

EPA's national web site [insert link]. Additional information regarding phosphate mining can be found at the Florida Institute of Phosphate Research web site [insert link].

[1.5.2 Interim Measures]

Additional data will need to be collected before interim measures can be identified. As discussed in the Potential Health Impacts section of this web site, the radiation levels expected to be found are relatively low and are not expected to pose any immediate health threats. This assessment is being conducted to assess the potential health affects that could occur over many years of exposure to low-level radiation.

As with other areas in the county that have naturally elevated levels of radium and radon gas, homeowners may want to have their homes tested for radon gas. Information on radon gas and mitigation techniques may be found at web sites maintained by EPA or the State of Florida [insert link]. The measurement of radon gas levels, however, may only provide an indication of part of the radiation sources. As discussed earlier, EPA is investigating not only the presence of possible elevated levels radiation due to radon gas but radium. The presence of radium has to be investigated using more sophisticated techniques than radon gas.

[1.5.3 Contact EPA and Others]

Additional information may also be obtained by contacting EPA via e:mail. Questions or comments should be forwarded to the EPA contacts below.

Carol Monell, Chief
Superfund Remedial and Technical Services Branch

Carl Terry, Director
Office of External Affairs

[The State may provide a contact also]

[1.4.3 Next Steps]

After the completion of the radiation assessment, EPA will make the results available for public review through this web site. EPA, in consultation, with the State of Florida, will also identify further actions, if any, that may need to be taken. Should areas be identified with levels of radiation that warrant further study, additional plans for further assessment will be developed and included in this web site.